REMARKS

Claims 51-94 are pending in the application. Claims 51 and 87-89 have been amended. The Specification has been amended to mention various reference numbers form the drawings. No new matter has been added in the amendments to the claims or the specification. Reconsideration of the claims is respectfully requested.

Claim 89 was amended to cancel the language "the second side of" and does not narrow the scope of the claim.

Applicants thank the Examiner for favorable consideration and conditional allowance of Claims 79-87 and 90-94.

Corrections to the Drawings

Figures 1 and 2 were objected to because they were not designated as *PRIOR ART*. Applicants have submitted drawing changes herewith to overcome this objection.

Figure 7 was objected to because the reference numbers 42a and 42b were not mentioned in the Specification. An amendment to the Specification has been made that now includes a reference to diffractive optical elements (42a and 42b).

Figures 10 and 12 were objected to because the reference numbers 42 and 43 were not mentioned in the Specification. Figure 10 has been amended to remove numeral 42. The Specification has been amended to make reference to the aspheric mirror (43) and diffractive optical element (42)

Figure 11 was objected to because the reference number 65 was not mentioned in the Specification. Applicants respectfully disagree, and refer the Examiner to page 40, lines 28-30, where it is stated that "the reference light used to illuminate the object enters the base plate 61 via an entrance aperture 65." Accordingly, Applicants request that this objection be removed.

The drawings are objected to for failing to show the reference sign "45" (page 11, 41, line 11) in Figure 11. The text states, at page 41, lines 9-11, "A ray trace of the light for the distance sensing means 67 is shown in Fig. 10. For this preferred embodiment, a prism 45 is used to bend the focused light..." Review of Figure 10 shows that element 45 is shown and correctly labelled. Accordingly, Applicants request that this objection be removed.

It is believed that all drawings comply with 37 C.F.R. § 1.84.

Claim Objections

Claim 88 was amended to change "entrance aperture" to "input means". This amendment was not made for reasons of patentability and does not narrow the scope of the claim. The amendment to claim 87 corrects its dependence. The amendment was not made for reasons of patentability and does not narrow the scope of the claim.

Double Patenting

Claims 51-72 and 88 were rejected under the judicially created doctrine of obvious-type double patenting as being unpatentable over the claims of U.S. Patent Application No. 09/907,874. Since basis for this rejection is a pending patent application, this double patenting rejection should only be provisional, and will become a non-provisional double patenting rejection when the '974 application issues as a patent. See MPEP § 804. The provisional double patenting rejection will be addressed if and when the '974 application issues as a patent.

Rejection under 35 U.S.C. § 112

Claim 79 is rejected under 35 U.S.C. § 112 second paragraph for being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. It is stated in the Office Action that the phrase, "a variation of the output measurement signal with reference light spectrum being less than a variation in the measurement signal with reference light spectrum," is indefinite, since it is unclear how the variation can be less than the same variation.

Applicants respectfully contend that the claim has been misunderstood and is not vague and indefinite. The claim mentions three different signals, namely i) the measurement signal received from the light detector unit, ii) the reference signal received from the light detector unit and iii) the output measurement signal produced by the analyzer using signals i) and ii). The variation in the output measurement signal [signal (iii)] that arises from a variation in the reference light spectrum is less than the variation in the measurement signal [signal (i)] that arises from the variation in the reference light

spectrum. Applicants believe that this is not vague and indefinite, and that all claims comply with 35 U.S.C. § 112.

Rejections under 35 U.S.C. § 103(a)

Claims 51, 55-57, 59-64, 66 and 88 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lemoff et al. (U.S. Patent 6,198,864) (Lemoff). Lemoff teaches a demultiplexer in FIG. 2, in which light is introduced to the device via a fiber (42). The light reflects off a flat objective mirror (88) and a convex integrated mirror (81) to collimate the light. The light then reflects off a series of filters (20, 22, 24 and 26) and relay mirrors (30, 32 and 36). Each filter passes light in a particular passband, while reflecting the remainder of the light on to the next filter.

The invention of amended claim 51 is directed to an apparatus for measuring spectral information of light from at least one object. The apparatus comprises a transparent body having a front side and a back side. The front side includes an entrance surface having at least one entrance aperture for receiving light, and at least a first front reflecting surface. The back side includes at least a first back reflecting surface for reflecting light received from the at least one entrance aperture to the at least one front reflecting surface, and an exit surface. At least one of the at least a first front reflecting surface and the at least a first back reflecting surface includes a first diffractive optical element. At least one of the at least a first front surface and the at least a first back reflecting surface include a first focusing element. The first diffractive element is arranged to disperse diverging light received from the at least one entrance aperture. A light detector unit is arranged to receive the dispersed light through the exit surface from the at least one reflecting surface on the front side.

The invention of claim 88 is directed to an apparatus for measuring spectral information of light from at least one object. The apparatus includes a transparent body having a front side and a back side. The front side includes an entrance surface having at least one input means for inputting light from the object, and at least a first front reflecting surface. The back side includes at least a first back reflecting surface for reflecting light received from the at least one input means to the at least one front reflecting surface, and an exit surface. At least one of the at least a first front reflecting

surface and the at least a first back reflecting surface includes a first diffracting means for diffracting light. At least one of the at least a first front surface and the at least a first back reflecting surface includes a first focusing means for focusing light. The first diffracting means is arranged to disperse diverging light received from the at least one entrance aperture. Light detecting means is used for detecting light transmitted out of the exit surface.

Three criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or combination of references, must teach or suggest all the claim limitations. MPEP § 2142. Applicants respectfully traverse the rejection since the prior art fails to disclose all the claim limitations.

There are important differences between the invention as claimed and what is taught by Lemoff. First, Lemoff teaches a device that uses a series of filters to split an incoming light beam up into components of different wavelength. In contrast, in the present invention, a diffracting element is used to disperse the incoming light. Therefore the basic principles on which the device of the present invention and that taught by Lemoff are different. Lemoff is based on frequency-selective reflection while the invention of claims 51 and 88 are based on frequency selective diffraction.

Second, Lemoff teaches the use of diffractive lenses for focusing the output beams from each of the filters (col. 7, lines 58-61). Thus, any diffractive element that Lemoff might use is used only with narrow-band light (it has passed through the filter). The diffractive element of the present invention, on the other hand, receives diverging light from the input slit, and disperses that light. The dispersed light is received by the detector unit. Thus, the use of diffraction in the two cases is different. Lemoff uses diffraction to focus narrow-band light. The present invention uses diffraction to disperse the input light, whatever its bandwidth. Accordingly, one of ordinary skill in the art would not be motivated to modify Lemoff's device to include a diffracting lens in order to produce the claimed device, since Lemoff's diffracting lens is placed only to focus light of a small bandwidth that has been separated from the rest of the light.

Thus, Lemoff does not teach a first diffractive element arranged to disperse diverging light received from the at least one entrance aperture, and fails to teach all the elements of the claimed invention. Applicants also contend that, due to the important differences between the devices defined in claims 51 and 88 and that taught by Lemoff, claims 51 and 88 are not obvious in view of Lemoff and are patentable thereover.

Dependent claims 55-57, 59-64, and 66, which are dependent from independent claim 51, were also rejected under 35 U.S.C. §103(a) as being unpatentable over Lemoff. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 51. These dependent claims include all of the limitations of the base claim and any intervening claims, and recite additional features which further distinguish these claims from the cited references. Therefore, dependent claims 55-57, 59-64, and 66 are also in condition for allowance.

Dependent claims 52-54, 58, 65-72 are also rejected under 35 U.S.C. § 103(a), based on various combinations of Lemoff with other references:

Claims 52-54 are rejected as being unpatentable over Lemoff in view of Hopkins (U.S. Patent 5,644,396).

Claims 58, 66, 67, and 68 are rejected as being unpatentable over Lemoff in view of Ridyard et al. (U.S. Patent 5,812,262) (Ridyard). It is important to realize that Ridyard fails to teach a diffraction element on which divering light is incident. Instead, Ridyard teaches that the light (38) incident on the diffraction grating (28) is converging.

Claim 65 is rejected as being unpatentable over Lemoff in view of Ridyard and further in view of Lim (U.S. Patent 5,504,629).

Claim 69 is rejected as being unpatentable over Lemoff in view of Ridyard and further in view of Uehara et al. (U.S. Patent 4,332,706).

Claim 70 is rejected as being unpatentable over Lemoff in view of Ridyard and further in view of Uehara et al. and further in view of Ohkubo et al. (U.S. Patent 5,622,904).

Claims 71-72 are rejected as being unpatentable over Lemoff in view of Hammer (WO 98/12541).

These claims depend from claim 51 which, as has been discussed above, is allowable. The secondary references do not correct the deficiencies of Lemoff discussed above. Therefore, these claims are also allowable.

Claim 89 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Ridyard et al. in view of Hagler (U.S. Patent 6,271,917). It is stated in the Office Action that Ridyard discloses all the steps of claim 89 except for using a focusing reflector. It is also stated in the Office Action that Hagler teaches the use of a focusing reflective grating (col. 12, lines 25-30), and that it would have been obvious at the time the invention was made to use the grating as a focusing element, for the spectrum is focused onto the detector array.

The method of claim 89 is directed to method of measuring spectral information of light from an object. The method includes:

i) inputting signal light from the object to a transparent body through an entrance aperture on a first side of the body;

ii) propagating divergent signal light from the entrance aperture to a diffractive element on a second side of the body;

iii) diffracting the divergent signal light with the diffractive element into separated wavelength components;

iv) reflectively focusing the divergent, separated wavelength components to an exit face using a focusing reflector on the body; and

v) detecting the focused, separated wavelength components using a detector unit.

Applicants respectfully contend that the proposed combination of references fails to teach all the steps of the claimed method. For example, regarding step ii), Ridyard does not teach the propagation of divergent signal light from the entrance aperture on one side of the body to a diffractive element on a second side of the body. Ridyard shows that the light (36) diverging from the slit (18) is first incident on a curved face (20). The curved face has a focusing effect so that the light (38) incident on Ridyard's diffraction grating (28) is converging, not diverging. Furthermore, the diffraction grating is on the same side of the body as the entrance slit, not the other side of the body. Accordingly, Ridyard fails to teach step ii).

Regarding step iii), Ridyard fails to teach the diffraction of the divergent signal light. Instead, as was noted in the preceding paragraph, the signal light incident on the diffraction grating is converging, not diverging. Consequently, Ridyard's diffraction grating diffracts convergent light, not divergent light.

Regarding step iv) Ridyard fails to teach reflectively focusing divergent, separated wavelength components to the exit face. Instead, Ridyard focuses the light using the curved surface that lies in the optical path between the input slit and the diffraction grating, thus focusing the light before it is incident on the diffraction grating. Ridyard focuses the input signal light, not wavelength components that have been separated by diffraction. In the claimed method, the focusing takes place on the separated wavelength components that are separated by the diffraction grating.

Thus, Ridyard fails to teach or suggest at least three of the steps of the claimed method.

Hagler fails to correct the deficiencies of Ridyard. Hagler teaches a spectrometer that uses a curved diffraction grating (36). Hagler also fails to teach step iv), namely focusing diverging, wavelength separated components. Hagler only teaches the use of a curved grating, which separates wavelength components. Hagler does not teach or suggest the placement of any focusing elements following the curved diffraction grating. Accordingly, there are no diverging, wavelength separated components in Hagler that are focused. Thus, the proposed combination of references fails to teach or suggest all the elements of claim 89.

Furthermore, the motivation provided in the Office Action is insufficient. It is stated that it would be obvious to use the curved grating to focus the components to an detector array. However, this is already achieved in the structure taught by Ridyard. One of ordinary skill in the art would not be motivated to add a complex component like a curved grating to the spectrometer system simply in order to achieve the same result as before.

Accordingly, the proposed combination of references fails to teach or suggest all the steps of claim 89, and so claim 89 is allowable over the proposed combination of references.

Conclusion

In view of the amendments and reasons provided above, it is believed that all pending claims are in condition for allowance. Applicants respectfully request favorable reconsideration and early allowance of all pending claims.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' attorney of record, Iain A. McIntyre at 952-253-4110.

Respectfully submitted,

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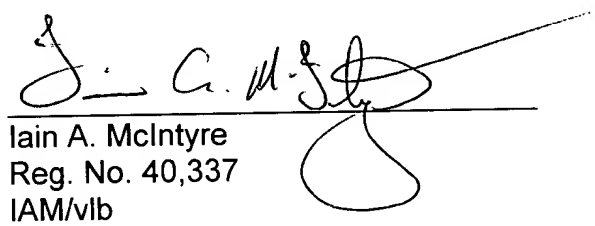
Date: August 25, 2003

By: 

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